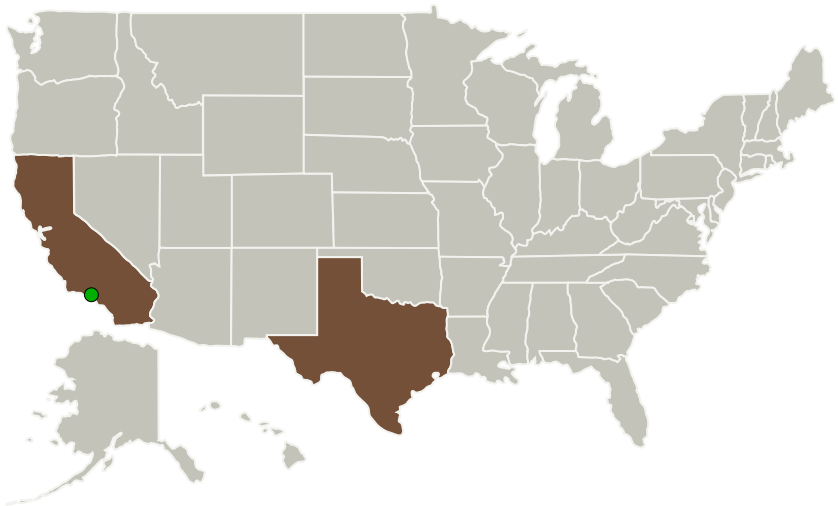
Proximity Glare Suppression for Astronomical Coronagraphy, Phase I

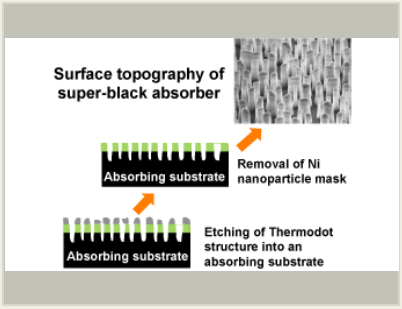
Completed Technology Project (2017 - 2017)

Project Introduction

There is a critical need for stray light suppression in advanced astronomical telescopes and imaging systems. For optical instruments that are required to view objects with brightness dynamic ranges on the order of 1010, precise control of diffraction and scattering from occulting apertures, Lyot stops, shields, and baffles is critical. Super-black broadband absorbers can help control stray light, and work by absorbing light across the ultra-violet, visible, and infrared spectral regions. No stray-light control application is more stressing than space-based astronomical telescopes because the stray light characteristics of the instrument itself typically limits the ultimate contrast of the imagery. Ultimately, the reflection or scattering of light from an absorber will be limited by the effective "impedance mismatch" of the electromagnetic wave as it transits the interface from the incident medium (i.e. vacuum) to the absorber medium. Recent developments in the patterning of nanostructures have opened great opportunities for the fabrication of nanostructured films which exhibit gradual transitions in refractive index, leading to high performance broadband antireflection coatings and enhancement of black-body absorption. Surface nanostructures that have sub-wavelength dimensions can greatly reduce light reflection, and are biomimetic to moth's eyes, which are designed to minimize reflection in the VIS and NIR spectral bands. Nanohmics proposes to use its "Thermodot" technology to produce a sub-wavelength structured surface that effectively couples incoming electromagnetic waves into a material with vanishingly small reflectance. Nanohmics proposes to extend the Thermodot technology to absorbing substrates to produce non-reflecting super-black absorbing materials with performance characteristics compatible with space-based telescopes.

Primary U.S. Work Locations and Key Partners





Proximity Glare Suppression for Astronomical Coronagraphy, Phase I Briefing Chart Image

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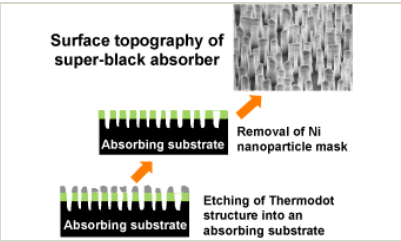
Organizations Performing Work	Role	Type	Location
Nanohmics, Inc.	Lead Organization	Industry	Austin, Texas
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Texas

Images



Briefing Chart Image
Proximity Glare Suppression for Astronomical Coronagraphy, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/131457)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Nanohmics, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

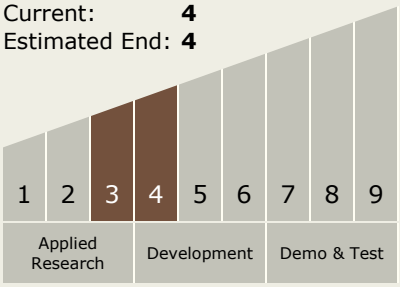
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Karun Vijayraghavan

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System